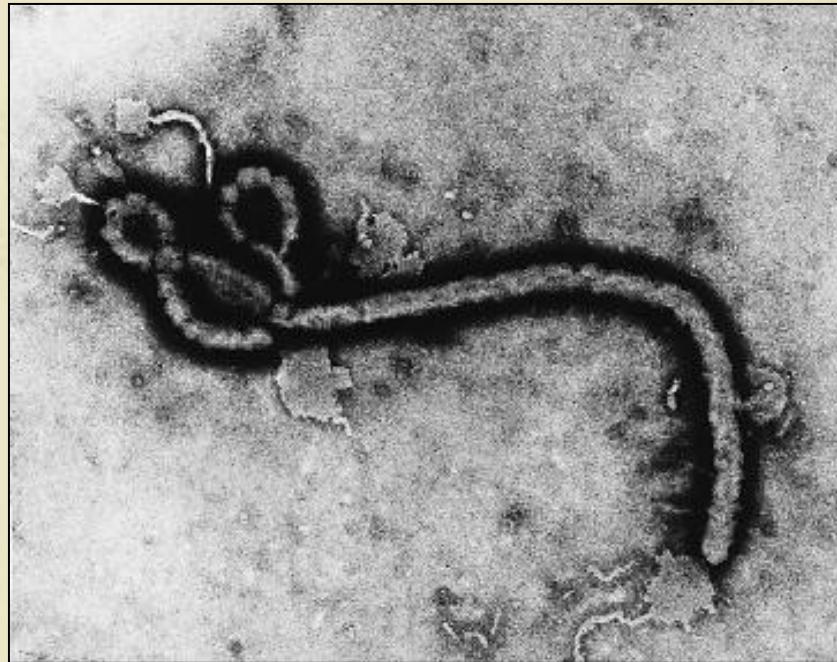




# ***Medical NBC Briefing Series***

## ***Medical NBC Aspects of***

# **Ebola**





# Purpose

- *This presentation is part of a series developed by the Medical NBC Staff at The U.S. Army Office of The Surgeon General.*
- *The information presented addresses medical issues, both operational and clinical, of various NBC agents.*
- *These presentations were developed for the medical NBC officer to use in briefing either medical or maneuver commanders.*
- *Information in the presentations includes physical data of the agent, signs and symptoms, means of dispersion, treatment for the agent, medical resources required, issues about investigational new drugs or vaccines, and epidemiology.*
- *Notes page.*



Office of the Surgeon General  
for the Army



# Outline

- Background
- Battlefield Response
- Medical Response
- Command and Control
- Summary
- References





# Background

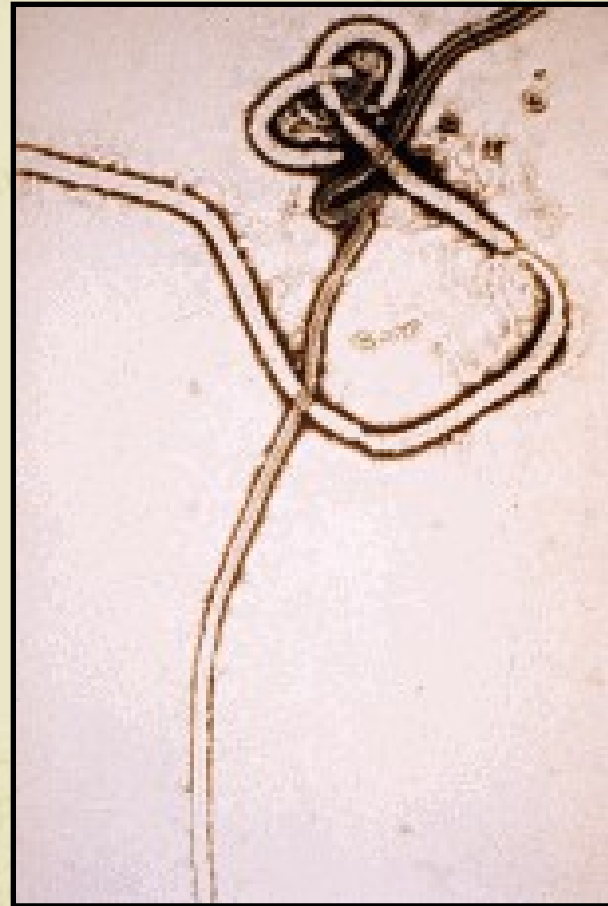
- **Disease Background**
- **General Background**
- **Disease Course Summary**
- **Signs and Symptoms**
- **Diagnosis**
- **Treatment**
- **Current Situation**
- **Weaponization**





# Disease Background

- **RNA viruses**
- **Ebola virus recognized in -Zaire in 1976**
- **mortality rate ranges from 30 to 90 %**





# Ebola Disease Course Summary In Untreated Individuals

Individuals						
Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
<b>EXPOSURE</b>		High fever, headache, muscle aches, stomach pain, fatigue, diarrhea				
		Incubation 2-21				
Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
Chest pain, shock, and death within one week of infection						
		Incubation 2-21				
Day 15	Day 16	Day 17	Day 18	Day 19	Day 20	Day 21
		Incubation 2-21				
Day 22	Day 23	Day 24	Day 25	Day 26	Day 27	Day 28



# **Signs and Symptoms - Ebola**

- **Sudden onset of back pain, sore throat, muscle pain, headache, and nausea**
- **Skin rash (papular or maculopapular), fever, low platelets, gastrointestinal bleeding**
- **Rapid progression to jaundice; increased bleeding abnormalities**
- **Death from encephalitis, fulminant hepatitis, pulmonary and gastrointestinal hemorrhage**



# Signs and Symptoms - Ebola

- **Bloody diarrhea**
- **Same symptoms as Marburg Virus**





# Diagnosis - Clinical

- Large numbers of individuals in the same geographic area presenting over a short time span
- Acute onset of fever, muscle pain, and extreme exhaustion





# Diagnosis - Laboratory

- **Blood and urine tests**
- **Requires maximum biosafety laboratory**
- **Handling specimens should be with extreme caution and special collection and handling methods must be used**





# Treatment

- **Quarantine of known cases**
- **Supportive care - substantial advanced medical supportive care is necessary**
  - Intensive care unit facilities
  - Oxygen
  - Hydration (IV therapy)
  - Ventilation support for severe cases
  - Pain management
  - Avoiding blood-thinning





# Current Situation

- **Currently endemic in Africa**
- **As a biological warfare agent, Ebola poses a significant threat to ground troops**
  - Highly transmissible
  - Infectious
  - Lethal
  - Easily dispersible to ground troops as an aerosol
  - Stable in the environment
- **International deployments**
- **Risk of importation/exportation of disease**



# Weaponization

- **Aerosolization**
  - Inhalation threat
  - Delivery systems can be s
    - Spray systems
    - Sub munitions
    - Detonation containers
    - Crop duster or boat
    - Bomblets
    - Aircraft





# Battlefield Response to Ebola

- **Detect**
- **Protect**
  - Individual protection
  - Collective protection





# Detection

- **Possible methods of detection**

- Detection of agent in the environment
- Clinical (differential diagnosis)
- Medical surveillance (coordination enhances detection capability)



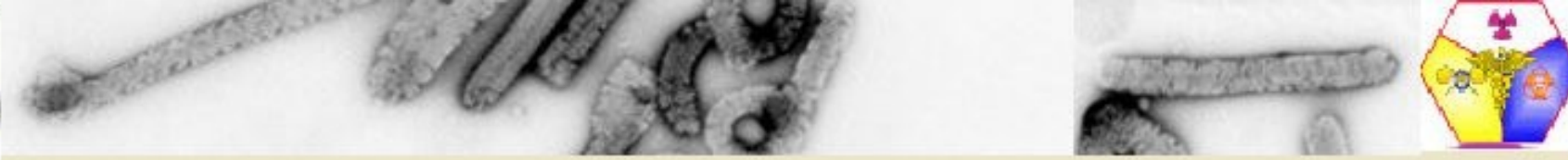
- **Diagnosis of Ebola is not presumptive of a BW attack - the disease may be endemic to the area**



# Detection of Agent in the Environment

- Biological Smart Tickets
- Enzyme Linked Immunosorbant Assay (ELISA) (Fielded with the 520th TAML)
- Polymerase Chain Reaction (PCR) (Fielded with the 520th TAML)





# Detection of Agent in the Environment (cont.)

- M31E1 Biological Integrated Detection System (BIDS)
- Interim Biological Agent Detector (IBAD)



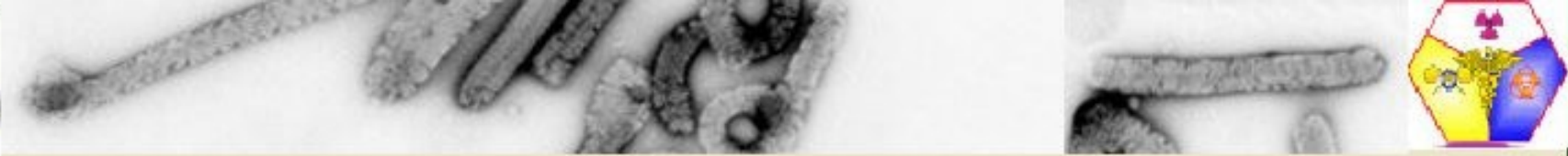


# Clinical Detection

## Sudden presentation of

- High fevers, muscle pain, and extreme exhaustion presenting in groups
- Rapid progression of symptoms





# Laboratory Confirmation

- **Division medical assets lack lab equipment to conduct test to determine hemorrhagic fevers**
- **Specimen must be sent to theater level or CONUS lab**
  - Unit SOP's for collection
  - Safety precautions
- **Lab specimens should be submitted to the correct diagnostic laboratory**
- **Contact lab prior to collection or preparation in order to assure proper**



# Laboratory Confirmation (cont.)

## Points of contact for biological sampling and shipping

- Corps Chemical Officer
- Technical Escort Unit
- AFMIC
- 520th TAML
- USAMRIID
- WRAIR





# Medical Surveillance

Clues in the daily medical disposition reports of a BW Attack

- Simultaneous presentations of large numbers of infected
- Natural outbreaks would have an index case and the numbers would build



MARYLAND ARMY NATIONAL GUARD  
DISCOM 29<sup>th</sup> Infantry Division (Light)  
DIVISION MEDICAL OPERATION CENTER (DMOC)



## Patient Summary Report 29<sup>th</sup> INF (L) DIV

From: Division Medical Operations Center (DMOC)  
To: Division Surgeon

Date Time Group: From: 121200RJUN99  
To: 202400RJUN99

### PATIENTS

Nation	WIA	NBI	Disease	Neuropsychiatric Stress-Related	Total
US	0	97	55	0	152
Allied	0	0	0	0	0
EPW	0	0	0	0	0

### DISPOSITION

Return to duty	148
Holding in Division's MTFs	0
Evacuated and returned	3
Evacuated by air	0
Evacuated by ground	1
Expired en route	0
Expired in MTF	0



# Individual Protection

- **Mask and BDO with gloves and boots.**
- **Standard uniform clothing affords a reasonable protection against dermal exposure to biological agents**
- **Casualties unable to wear MOPP should be handled in casualty wraps**





# Collective Protection

- Hardened or unhardened shelter equipped with an air filtration unit providing overpressure
- Standard universal precautions should be employed as individuals are brought inside the collective protection units
- Ebola is communicable from person to person
- Contaminated articles can be decontaminated using 0.05%





# Medical Response to Ebola

- Triage and Evacuation
- Evacuation or Quarantine
- Infection Control
- Resource Requirements





# Triage and Evacuation

- **Triage**
  - Priorities based on severity of symptoms
  - Respiratory support, ICU needs, and quarantine facilities will increase priorities
- **Evacuation -Immediate**
  - Considerable infection control precautions during transport
  - Must consider quarantine in place in a mass casualty situation
  - Evacuation of patients will be METT-T dependent



# Evacuation or Quarantine

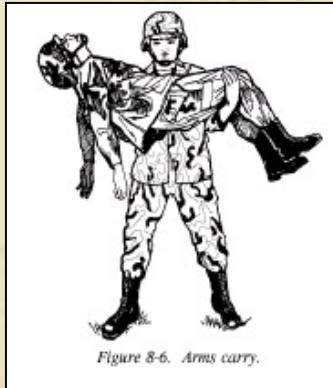


Figure 8-6. Arms carry.

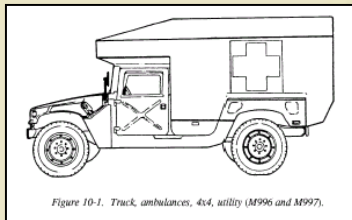


Figure 10-1. Truck, ambulances, 4x4, utility (M996 and M997).

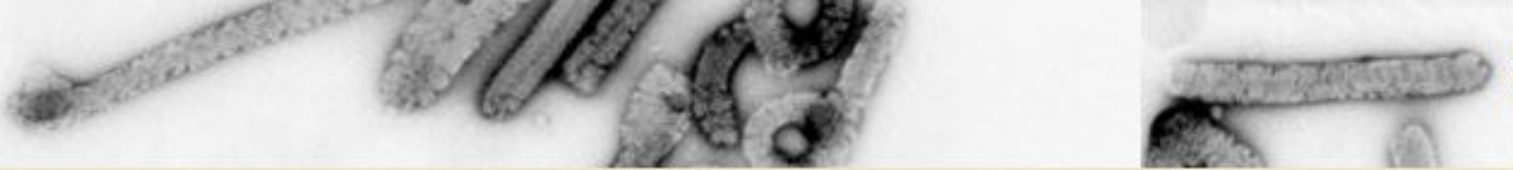
- Ebola patients not likely to RTD in the normal theater evacuation policy of 15 days
- Strict interpretation of the doctrine calls for evacuation

- **Quarantine**

- Contagious
- Limit spread of the virus
- Unlike smallpox, Ebola is already endemic to various parts of the world

- **Guidance**

- Before evacuating patients suspected of Ebola, seek guidance from the



# Infection Control

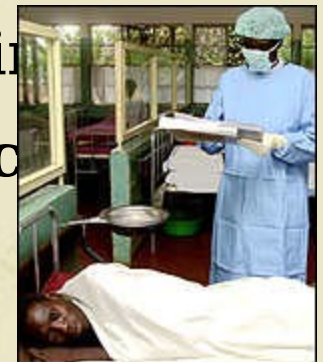
- **Communicable from person to person**
- **Single room with adjoining anteroom as only entrance**
  - Hand washing facility with decontamination solution
- **Negative air pressure if possible**
- **Strict barrier precautions**
  - gloves, gown, mask. Shoe covers, protective eyewear/faceshield
  - consider HEPA respirator for prominent hemorrhage, vomiting, diarrhea, cough
- **Patient remains - Quartermaster section**
  - Decontamination, embalming, transportation in hermetically sealed containers

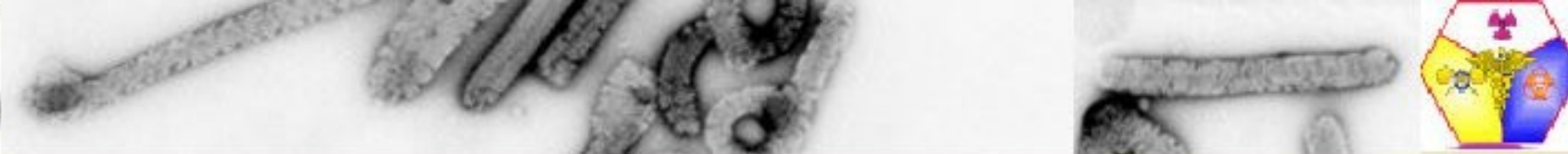
DOXYCYCLINE



# Infection Control (cont)

- Chemical toilet
- All body fluids disinfected
- Disposable equipment / sharps in rigid containers and autoclaved /incinerated
- Double-bag refuse-outside bag disinfectant
- Electronic/mechanical equipment or paraformaldehyde disinfected





# Resource Requirements

- **Specialized evacuation assets**
- **Isolation facilities**
- **Ribavirin**
- **Supportive therapies**
  - Vigorous IV therapy
- **Intensive care facilities**
- **Possibility for quarantine of mass amounts of compromised patients**
- **Specialized infection control equipment for care providers**
- **Quarantine, if imposed, would strain the supply chains**





# Command and Control

- **Intelligence**
  - Medical surveillance and intelligence reports are key to keep the Command alert to the situation
- **Evacuation of the sick or Quarantine**
- **Maneuver**
  - Quarantine or isolation is required of symptomatic patients
- **Logistics**
  - Additional Class VIII materials will be required and evacuation routes to Echelon III will be heavily utilized
  - Specialized evacuation assets may be required
- **Manpower**
  - Many soldiers may be affected by aerosol dissemination in a short period of time



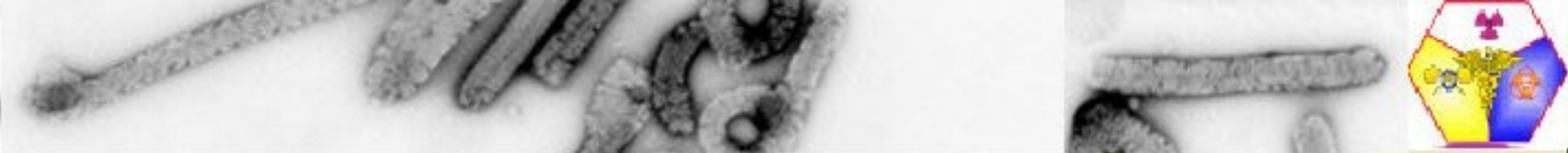
# Command and Control Response to Psychological Impact

- May vary from person to person
- **Psychological Operations**
  - Rumors, panic, misinformation
  - Soldiers may isolate themselves in fear of disease spread
- **Countermeasures**
  - LEADERSHIP is responsible for countering psychological impacts through education and training of the soldiers
  - Implementation of defensive measures such as crisis stress management teams



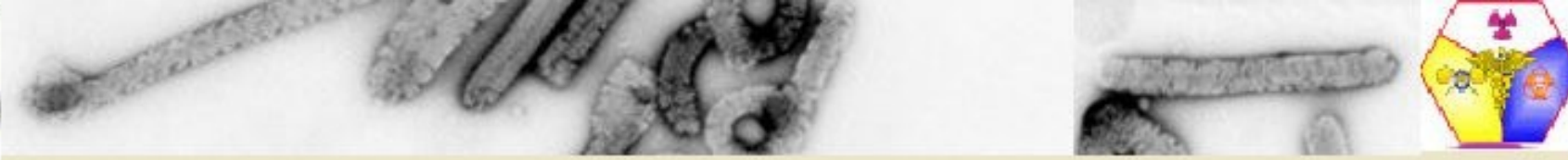
# Summary

- **Ebola virus is highly infectious when aerosolized**
- **The possibility for weaponization is highly probable**
- **Detection may not occur until after exposure when patients are reported**
- **Command decisions that will be required upon detection of Ebola:**
  - Evacuation or quarantine?
  - Evacuation: Many patients will be presenting at one time. Methods of evacuation?
  - Treatment: Procurement of additional antibiotics, equipment, and prophylaxis treatments? Isolation of



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